Bat GPS Telemetry

* SABRENet – South African Bat Research
* Longitudinal sampling
* Jon – behavior risk assessment in people
  + Bat movement
* 36 units (5.6g)
* Models about spillover pathways and human risk
* Charges in about 2 hours
* Telemetry Solutions brand
* Units speak to base station in two ways
  + Long range radio (impacted by terrain)
  + Bluetooth
* External repeater antennae for caves (1 in cave, 1 out of cave)

**Testing and code development prior to deployment**

* Aim: determine GPS settings to maximize the acquisition of useful data
  + Temporal resolution to isolate feeding behavior (potential route to transmission to humans)
  + Nights of coverage (do they roost in the same or different places)
  + Given this, how much resolution do we need?
* Received data in advance

Parameters

* 1) hours of day to be turned on
* 2) duty cycle (how often to turn on and attempt to repeat recording position)
* 3) time to search for signal
* 4) time to hone position

His strategy

* Drain battery full n times with short duty cycle to determine total battery “active time”
  + Note that this isn’t perfect because of signal strength variation
* Narrow parameter search space using outside data
* Explore duty cycle + signal search + hone time to maximize data given expected active time
* Are there patterns in when positions are and aren’t recorded?
* 41/166 successful data points

\*can plot data in R

\*get on the github

- threshold to foraging (how much time does the bat need to be in one single place)

- strip out data systematically to see what % of locations are still recovered with each duty cycle pattern (then you’ll get longer) ( he picked 10 minute duty cycling)

Oof, 10 minutes was a fail. Didn’t get signals. So he went back to 5 minutes to get more data.

Offline high-res data exploration

1. Download street maps tileset
   1. RgoogleMaps::GetMapTiles()
   2. Zoom 10-17
   3. Produced 350,000 15kb files
   4. \*looked up max area around cave they can fly to download strategically
2. Established pipeline to download and clean explored .tsd files from the base stations

Take homes:

* TEST TEST TEST
* Know precisely what you want to get out of your data to set parameters
* Prep analyses using sample or simulated data
  + Movebase
* Be prepared for how much variation that is hard to explain
* Ancient software only available for windows sometimes

**Deployment**

1. Local testing of GPS units
2. Positioning of GPS base stations and repeater
3. Getting data back

* Test every single GPS tag you’re using locally. Can they obtain satellite signal?
  + Drove + walked around in valley and woods

**Analysis post deployment**

* Can we go to where the bats are foraging? What are those habitats? Are they near people? Livestock?
* Only 18/26 units ever spoke back to the base station
  + Units might have fallen off right away, or maybe bats left area

Should I do a power analysis… we don’t have any more money soo…

\*\* effect of bat handling on movement.

**\*\*\*\*\*\*\*\*\*next March, go back to these locations that we are seeing bats visit to see what they are/if they are close to humans\*\*\*\*\*\*\*\*\*\***

* Tree species use vary by season (want to get through the whole year)
* Thus proximity to humans varies by season (spatial risk model)

What are my questions?

SUBPOPULATION CONNECTIVITY

* Where are these bats foraging? Does their foraging change seasonally? Are bats from different roosts foraging at the same location? Does their interaction at foraging locations change seasonally?
* Where do these bats roost? Does their roost location change seasonally? Are bats changing roosts? Does this change vary seasonally?

GENERAL ECOLOGY

* Where are these bats foraging? Does their foraging change seasonally? Are their foraging locations close to
* Where do these bats roost? Does their roost location change seasonally?

WANT:

* Data point during the day – roosting location
* Data point during the night – foraging location
  + How specific can I make this?
* For a goal of one year
  + Bella’s stayed on avg 6 months, how can I make them last longer?